

## **Meteorological Data Assimilation for Real-Time Emergency Response**

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The Atmospheric Release Advisory Capability (ARAC) project at Lawrence Livermore National Laboratory provides real-time dose assessments of airborne pollutant releases. Efficient and robust data assimilation is essential for such an emergency response capability. We are developing a hierarchy of algorithms to ingest, interpolate, and extrapolate data in order to provide three-dimensional gridded meteorological fields which can be used to drive dispersion codes or to initialize mesoscale models. Both vector (wind) and scalar (temperature, pressure, etc.) meteorological fields can be generated on continuous terrain grids with variable vertical and horizontal resolutions.

The first class of algorithms that we have developed are sparse data interpolators using either a split vertical-horizontal or a split horizontal-vertical approach in which interpolation and extrapolation are performed separately in the vertical and then in the horizontal or vice versa. The algorithms comprise an assortment of vertical interpolation and extrapolation methods and spatial weighting functions. Map projection dependent adjustments of length scales and direction are also incorporated. Improved empirical extrapolation algorithms, techniques for handling tower data, methods for matching surface observations to upper air profiles, and assorted interpolation weighting functions (based on station, distance, and time) are also being developed. Testing and validation of the sparse data interpolators has been performed using analytic terrain and winds, tracer experiments, and current observational data. Presently a new database is available which collects real-time observational data provided by the Air Force Global Weather Command. Development of additional software for the acquisition, storage, and extraction of gridded meteorological data is underway.

Other data assimilation algorithms are currently under investigation for incorporation into the ARAC system. These include iterative interpolators which provide filtering and fully three-dimensional analyses. Subsequently, advanced methods for merging gridded fields and local observational data will also be developed.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.